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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/868,405	06/14/2001	Ori J. Braun	001/02171	8894

44909 7590 12/01/2005

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EXAMINER	
YE, LIN	

ART UNIT	PAPER NUMBER
2615	

DATE MAILED: 12/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/868,405	BRAUN ET AL.	
	Examiner	Art Unit	
	Lin Ye	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 September 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17 and 19-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17 and 19-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 June 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 9/16/05 have been fully considered but they are not persuasive as to claims 1-17 and 19-32.

For claims 1, 14 and 27, the applicant argues that Stettner reference (U.S. Patent 5,446,529) does not discloses Unit cells 10 comprise a photosensor in Figures 1-5 and 9 (See Applicant's REMARKS, page 3, lines 10-15).

The examiner disagrees. The Stettner reference clearly discloses in Figures 5 and 9, the indium bumps 42, which **electrically connect** each photodiode (photosensor 41) with **a single, corresponding, analog-processing** readout electronics 19 of the unit cell 10 (See Col. 7, lines 39-41). This can be considered as each pixel of the plurality of pixels (unit cells 10) comprises an electronic circuit (e.g., the photodiode 41, indium bumps 42 and readout electronics 19 of the chip unit cell 10 are considered as the electronic circuit) formed on or in said semiconductor surface (e.g., the photodiode array 41 and unit cells 10 are integrated in and formed on the semiconductor surface 7 of the image sensor 3).

It also should be noted that the examiner understands the Stettner reference discloses in Figure 2 (one embodiment), the unit cells are sensitive to electrons produced in a photocathode formed on the vacuum side 82 of entrance window 8 and amplified by a microchannel plate 6 before they reach cells 10. However, the Stettner reference also discloses in Figures 5 and 9 (another embodiment), the image sensor (3) **does not use a microchannel plate** for electron multiplication but instead a high voltage is **applied directly**

between the photocathode and an anode composed of an array of semiconductor diodes (e.g., array of photosensors)(See Col. 7, lines 22-32). This clearly shows the image sensor (3) has a semiconductor surface (7) comprising a plurality of light sensitive pixels, wherein each pixel of said plurality of pixels comprises an electronic circuit (e.g., the photosensor 41, indium bumps 42 and readout electronics 19 of the chip unit cell 10 are considered as the electronic circuit) as shown in Figure 5.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-2, 4-9 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Stettner et al. U.S. Patent 5,446,529.

Referring to claim 1, the Stettner reference discloses in Figures 1-5 and 9, a semiconductor surface (CMOS image sensor 3 has a semiconductor surface 7, See Col. 5, lines 55-58 and Col. 6, lines 1-5) comprising a plurality of light sensitive pixels (array of the photodiode 40 and readout unit cell 10), wherein each pixel of said plurality of pixels comprises an electronic circuit (e.g., the indium bumps 42, which **electrically connect** each photodiode 41 with **a single, corresponding, analog-processing** readout electronics 19 of the unit cell 10 as shown in Figures 5, 9 and see Col. 7, lines 39-41. For this reason, the

photosensor 41, indium bumps 42 and readout electronics 19 of the chip unit cell 10 are considered as the electronic circuit) formed on or in said semiconductor surface (e.g., the photodiode array 41 and unit cells 10 are integrated in and formed on the semiconductor surface 7 of the image sensor 3 as shown in Figures 9-10), said circuit comprising: a photosensor (photodiode 41, See Col. 7, lines 38-41), that generates a signal responsive to light incident thereon at an output thereof; a current integrator (capacitor 25, see Col. 7, lines 15-16); a switchable current source (register 26,See Col. 6, lines 41-55 and Col. 13, lines 36-49) that can be turned on or off (logic one or zero, see Col. 13, lines 55-67), which when on provides a predetermined current that flows into the integrator; and circuitry that turns the switchable current source (26) on at a start time and subsequently turns the source off at a stop time and generates a signal responsive to current from the current source that is integrated by the integrator (25) between the start and stop times and wherein one of the start time and stop time is determined responsive to a signal generated by the photosensor (e.g., the switchable current source 26 of read out circuit 19 controls the integration time start and stop time of the integrator 25, see Col. 10, lines 10-20, Col. 11, lines 54-67 and Col. 12, lines 1-21).

Referring to claim 2, the Stettner reference discloses wherein said current integrator comprises a capacitor (capacitor 25, see Col. 7, lines 15-16).

Referring to claim 4, the Stettner reference discloses wherein the switchable current source comprises a flip-flop (register 26 using D-type flip flops to deselect and select the signal data from cell, See Col. 13, lines 35-65).

Referring to claim 5, the Stettner reference discloses wherein the circuit is formed as a monolithic integrated circuit (CMOS image processing chip 7).

Referring to claim 6, the Stettner reference discloses wherein the circuitry switches the switchable current source to on (logic one, See Col. 13, lines 55-60) at the start time (integration time) responsive to the signal from the photosensor (40).

Referring to claim 7, the Stettner reference discloses wherein the circuitry switches the switchable current source to off (logic zero, See Col. 13, lines 61-67) at the stop time (integration time) responsive to the signal from the photosensor (40).

Referring to claim 8, the Stettner reference discloses a 3D camera (three dimensional imaging device as shown in Figure 1, see Col. 5, lines 37-46) comprising a semiconductor surface (7) according claim 1.

Referring to claim 9, the Stettner reference discloses a semiconductor surface (7) according to any of claim 8; a light source (a pulsed laser 1, See col. 5, lines 47-54) that illuminates objects in a scene imaged with said 3D camera with at least one light pulse; wherein for each pixel of said plurality of pixels said start time is a time at with said at least one light pulse is radiated and said stop time is a time at which light from said at least one light pulse reflected by a surface region of said objects is incident on said pixel, and including circuitry that computes a distance between said pixel and said surface region responsive to the time lapse between the start and stop times (See Col. 8, lines 1-36).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 3, 10-17 and 19-32 rejected under 35 U.S.C. 103(a) as being unpatentable over Stettner et al. U.S. Patent 5,446,529 in view of Park U.S. Patent 5,015, 868.

Referring to claim 3, the Stettner reference discloses all subject matter as discussed in respected claim 1, except that the Stettner reference does not explicitly show a comparator having an input connect to the output of the photsensor and output connected to an input of the switchable current source.

The Park reference teaches in Figures 1 and 5, a real time distance sensor for measuring distance object, including a comparator (16, see Col. 3, lines 26-30) having an input connect to the output of the photsensor (CCD sensor 7, see Col. 2, lines 61-62) and output connected to an input of the switchable current source (flip flop 20); wherein when light incident on the photsensor has an intensity greater than a predetermined intensity (a reference voltage Vref), the output signal from the photosensor switches the switchable current source between on and off (See Col 3, lines 26-50). The Park reference is evidence that one of ordinary skill in the art at the time to see more advantages for the image sensor including a comparator detecting whether the light intensity is greater than the a predetermined intensity so that protecting the sensor is been saturated and can obtain a optimal exposure. For that reason, it would have been obvious to one of ordinary skill in the art at the time to modify the

semiconductor surface of Stettner's 3D camera by providing a comparator having an input connect to the output of the photsensor and output connected to an input of the switchable current source as taught by Park.

Referring to claim 10, the Stettner reference discloses all subject matter as discussed in respected claims 1 and 8, except that the Stettner reference does not explicitly show a light source controllable to illuminate an object with light from a fan beam.

The Park reference teaches in Figures 1 and 5, a real time distance sensor for measuring distance object, including a light source (laser 12, See Col. 2, lines 23-28) controllable to illuminate an object with light from a fan beam at known times wherein of the fan beam (as shown in Figure 3b) is defined by a scan angle and for different known times the scan angle is known and different; wherein said start time for said plurality of pixels is a time prior to illumination of the object by the fan beam and wherein for each scan angle (See Col. 2, lines 45-60) light reflected from the fan beam by a region of the object is incident on a pixel of the plurality of pixels and said stop time for the pixel is a time at which reflected light is incident on the pixel; and including circuitry (See Figures 4-5) that determines from the signal responsive to the current integrated between the start and stop times and the know times, a scan angle for the fan beam from which the pixel is illuminated and uses the scan angle and position of the pixel in the semiconductor surface to determine by triangulation a distance of the region from the pixel (See Col. 4, lines 24-51). The Park reference is evidence that one of ordinary skill in the art at the time to see more advantages for the real time distance image sensor using a fan beam with a reflected scan angle and position of the pixel in the semiconductor surface (CCD 7) to determine by triangulation a distance of the

region from the pixel so that the distance of object can be measured in real time and more accurately. For that reason, it would have been obvious to one of ordinary skill in the art at the time to modify the semiconductor surface of Stettner's 3D camera by providing a fan beam with a reflected scan angle and position of the pixel in the semiconductor surface (CCD 7) to determine by triangulation a distance of the region from the pixel as taught by Park.

Referring to claim 11, the Stettner and Park references discloses all subject matter as discussed in respected claim 10, and the Park reference discloses wherein said fan beam moves between scan angles at a rate so that differences between said stop times for different pixels illuminated with reflect light from said fan beam at different scan angles are greater than a given time difference and differences between said stop times for different pixels illuminated with reflected light from said fan beam at the same scan angle are less than the given time difference (See Col. 2, lines 66-67 and Col. 3, lines 1-30).

Referring to claim 12, the Stettner and Park references discloses all subject matter as discussed in respected claims 10-11, and the Park reference discloses wherein comprising a reflector (object 1 considered as a reflector) that resects light to at least one pixel in said semiconductor surface for each of said scan angles and wherein for a given scan angle, differences between said stop time for said at least one pixel and said stop times for pixels illuminated by light from said fan beam reflected by said object are less than said given time difference time difference (See Col. 2, lines 66-67 and Col. 3, lines 1-30).

Referring to claim 13, the Stettner and Park references discloses all subject matter as discussed in respected claims 10-12, and the Park reference discloses including a circuitry

(detection module 2 as shown in Figure 1 and 5) that determines said given scan angle from the location of said at least one pixel (from CCD sensor 7) (See Col. 2, lines 66-67 and Col. 3, lines 1-30).

Referring to claim 14, the Stettner and Park references discloses all subject matter as discussed in respected with same comments to claims 1 and 10.

Referring to claim 15, the Stettner and Park references discloses all subject matter as discussed in respected claims 1 and 14, and the Stettner reference discloses wherein said circuits (CMOS circuits) are formed in or on said semiconductor surface (chip 7).

Referring to claim 16, the Stettner and Park references discloses all subject matter as discussed in respected with same comments to claims 1, 5 and 10.

Referring to claim 17, the Stettner and Park references discloses all subject matter as discussed in respected claims 1 and 14, and the Stettner reference discloses wherein signal receiving circuitry having a plurality of inputs and wherein pixels for which said switches are simultaneously closed have said output terminals connected to different inputs of said signal receiving circuitry as shown in Figure 5.

Referring to claim 19, the Stettner and Park references discloses all subject matter as discussed in respected claim 17, and the Stettner reference discloses wherein said plurality of pixels comprises an array of pixels having rows and columns of pixels, wherein each pixel belongs to one row and one column of said array as shown in Figure 3.

Referring to claim 20, the Stettner and Park references discloses all subject matter as discussed in respected claim 19, and the Stettner reference discloses wherein said output

terminals of pixels in a same column of pixels are connected to a same input of said signal receiving circuitry as shown in figure 3 (See Col. 6, lines 3-13).

Referring to claim 21, the Stettner and Park references discloses all subject matter as discussed in respected claim 20, and the Stettner reference discloses wherein the controller closes, substantially simultaneously, said switches of all pixels in a same single row of pixels (See Col. 6, lines 31-48).

Referring to claim 22, the Stettner and Park references discloses all subject matter as discussed in respected claim 21, and the Stettner reference discloses wherein the controller sequentially closes row by row, the switches of all the pixels in a same signal row of pixels (See Col. 13, lines 6-15).

Referring to claim 23, the Stettner and Park references discloses all subject matter as discussed in respected claim 19, and the Park reference discloses the semiconductor surface (CCD sensor array 7) are parallel to the plane of said fan beam for all positions of said fan beam at which said fan beam illuminates said object as shown in Figures 2-3.

Referring to claim 24, the Stettner and Park references discloses all subject matter as discussed in respected claim 21, and the Stettner reference discloses wherein an output of said photsensor 941) is connected to a contact terminal of said switch (MOSFET switch 23 and register 26, see Col. 6, lines 34-35).

Referring to claim 25, the Stettner and Park references discloses all subject matter as discussed in respected with same comments to claims 3 and 14.

Referring to claim 26, the Stettner and Park references discloses all subject matter as discussed in respected claim 25, and the Park reference discloses wherein said output of said comparator (16) is connected to a contract terminal of said switch (flip flop 20).

Referring to claim 27, the Stettner and Park references discloses all subject matter as discussed in respected with same comments to claim 14.

Referring to claim 28, the Stettner and Park references discloses all subject matter as discussed in respected with same comments to claim 19.

Referring to claim 29, the Stettner and Park references discloses all subject matter as discussed in respected claim 28, and the Park reference discloses the group of pixels (array 14) comprises all pixels in a same row of pixels as shown in Figure 4.

Referring to claim 30, the Stettner and Park references discloses all subject matter as discussed in respected claim 25, and the Stettner reference discloses sensing signals from pixels in the semiconductor surface in a plurality of rows of pixels sequentially, row by row as shown in Figure 3.

Referring to claim 31; the Stettner and Park references discloses all subject matter as discussed in respected claim 25, and the Stettner reference discloses comprising providing a signal sensing means and wherein sensing signals comprises sensing signals from all pixels in a column of pixels on a same input of said sensing means by column shift register (14) and a multiplier output driver (16) as shown in Figure 3.

Referring to claim 32, the Stettner and Park references discloses all subject matter as discussed in respected claim 25, and the Stettner reference discloses comprising wherein said signal receiving circuitry comprises an encoder (multiplier/output driver 16) and said output

terminals of pixels in a same column o pixels are connected to a same input of the encoder as shown in figure 3.

Conclusion

6. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lin Ye whose telephone number is (571) 272-7372. The examiner can normally be reached on Mon-Fri 8:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Ometz can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lin Ye
Examiner
Art Unit 2615

November 28, 2005